

PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improvements in Tobacco Cutting Machines

I, KURT KÖRBER, a German Citizen, of 10, Am Pfingstberg, Hamburg-Bergedorf, Germany, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to tobacco cutting machines in which the tobacco flowing through a mouthpiece is compressed and a cutter roller provided with knives on its periphery rotates in front of the mouthpiece.

In accordance with the present invention a tobacco cutting machine in which the tobacco is forced through a mouthpiece and in which a rotary cutter roller provided with knives on its periphery is arranged in front of the mouthpiece, is characterised in that the sharpening mechanism for said knife roller and truing means acting on said sharpening mechanism are all located in a subsidiary frame which is separable from a frame supporting the rest of the machine and that said sharpening mechanism is operable during the cutting operation, the setting of the truing means in the subsidiary frame determining the position of the sharpening mechanism and consequently the position of the cutting edges of the knives in relation to the mouthpiece when the subsidiary frame is in its working position adjacent the mouthpiece.

In order that during cutting the compressed tobacco strip shall be cut obliquely thereto, the knife edges running parallel to the roller axis preferably make an angle in the vertical plane with the mutually opposed upper surface of the tobacco strip, which angle is for example about 5°. For this purpose either the roller axis is offset in an inclined manner by about 5° to the upper surface of the horizontally moving tobacco strip or the said upper surface is inclined to the horizontally disposed roller axis. In both cases the knives are disposed in straight-line arrangement on the periphery of the

roller so that the knives may be sharpened and adjusted during the operation of the machine. By this arrangement of the cutter roller and associated parts in a subsidiary frame, the roller can be separated from the mouthpiece of the machine in order when necessary to be moved clear therefrom if for example foreign bodies must be removed from the tobacco strip, or in order to be able to trim off the initial projecting end of the tobacco strip by means of a cutting device provided on the machine. These features of the machine and also others are further explained as constructional examples on the drawings in which Fig. 1 is a side view of the machine partially in section, Fig. 2 is a view from the front, and Fig. 3 a plan view, Fig. 4 shows another embodiment of the machine in longitudinal section, Fig. 5 is a front view of the same machine in which for simplicity the grinding mechanism of Fig. 5 is omitted. Fig. 6 is a plan view of Fig. 4 in which the cutting rollers are separated, and Fig. 7 is a plan of another machine in which the cutting roller has been pivoted away from the tobacco mouthpiece.

In Figs. 1, 2, and 3, 1, represents the knife roller on the periphery of which five knives 2 are provided for example. Knife roller 1 is pivotally mounted in front of the mouthpiece through which the tobacco strip 3 is pressed forwardly in the direction 3' by means of the conveyor bands 4 and 5. The lower conveyor band 5 serves only for the conveyance movement 3' while the upper band 4 receives in addition an upward and downward movement. For this purpose the conveyor band 4 is pivotally mounted on a shaft 4a and is forced downwardly by a weight 8 by means of the connection rods 6, 7. The up and down movement of the band 4 around the shaft axis 4a is transmitted by means of a lever 9 to a slide member 10 mounted in the machine frame and which is connected to the upper mouthpiece jaw 3a so as to participate in

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the up and down movement of the band 4. The lower mouthpiece jaw 3b remains stationary. The driving of the two bands is effected from a motor 11 by means of the gear wheels 12, 13, 14, 14', 14'', 15, 16, 17 of which the wheels 15 and 16 are carried by the connection levers 18, 19, 20 so that transmission of the drive is independent of the up and down movement of the band 4.

By means of the conveyor device described, satisfactory delivery through the mouthpiece 3a, 3b of the tobacco strip 3 is ensured. When it is not in operation the upper conveyor band can be raised from outside the machine frame by a crank 21 whereby a cable drum 23 is rotated through the worm drive 22 and the weight 8 and thereby through the rods 6 and 7 the conveyor band 4 is raised.

In front of the mouthpiece 3a 3b which for example is inclined to the horizontal at an angle of about 5° (considered in a vertical plane) rotate the knives 2 which are secured in an adjustable manner to the periphery of the roller 1 rotatable on a horizontal shaft. For this purpose each knife 2 is adjustable by two spindles 24 of which only one pair is shown on Fig. 2 and on each of which is provided a nut 25 connected to the knife 2 concerned. The spindles 24 are driven by means of a worm wheel 26 and a worm 27. On the shaft 27a (Fig. 2) of the worm 27 is disposed a worm wheel 28 which is freely rotatable and can be coupled by means of a clutch not shown to the shaft 27a. The worm wheel 28 engages the worm 29 (Fig. 1 also) on which a feed wheel 30 is provided which is operated through a pawl 31, a transmission lever 32 and a roller 33, when the roller drum 1 in this rotation causes one of the feed rollers 33 to bear against a stationary cam 34.

Each knife 2 embodies the self-adjusting mechanism described which during each rotation of the roller 1 is fed by one tooth and thereby operated to a very small extent so that each knife blade is adjusted to a slight extent after each passage across the tobacco strip 3. An adjustable arm may be disposed on the nuts 25 which for example operates an acoustic signal when the knife is worn away to the limit. In order that in any case the knives can be slid forward no further than the limit the spindle ends are not threaded on their ends with the result that the feed nuts 25 can no longer operate.

When a knife 2 is to be changed the worm wheel 28 is freed and the shaft 27a rotated by hand whereby the new knife can be fitted rapidly without operating through the worm drive reduction train.

In order that the edge of the new knife

shall always be set in the same cutting position a lever mechanism is provided above the roller 1 on the frame of the machine which can be brought into position as a stop for the knife edge in the rotary zone of the knife. This lever mechanism comprises e.g. an adjusting lever 35 provided with a hand grip and a stop lever 36 subject to the action of a spring; the front piece 36a of the lever 36 is adjustable. When not in use the lever mechanism is set permanently out of the range of the knives 2 and it is only turned into the paths of the knives when required. In order that the roller 1 can be secured for this purpose there is provided on the end face of the roller 1 for example a locking ring 53 in the apertures or other recesses of which a locking pin 54 (Fig. 2) can be introduced, being controlled by a lever 55.

After each feed of the knives these are sharpened during the running of the machine. For this purpose a rotary grinding wheel 37 is provided driven by a motor 38 for example in an inclined position in order that a cone shaped grinding wheel 37 can sharpen the edges of the knives 2 when it is correspondingly moved. The grinding wheel 37 can be used until it is reduced to a small diameter. Movement of the grinding wheel is effected (Fig. 3) both in the direction 38^I along the cutting edge as also in the direction 38^{II}. For this purpose the motor 38 is located on a slide 40 guided for example on the rails 39 and is slidably parallel to the axis of the roller 1 by the fact that the slide 40 carries a spindle 41 which is driven from a motor 43 by means of a gear drive 42 (see also Fig. 2). At the ends of the movement 38^I the wheel engages a diamond 44 or 45 (Fig. 3) for trueing the grinding surface of the cone shaped grinding wheel 37 when this reaches one of the end positions of the movement 38^I. The position of the diamonds 44, 45 thus determines the setting of the cutting edges of the knives 2. A water jet cools the trueing device. The backward and forward movement of the slide 40 is automatically controlled in that in known manner (see Fig. 2), an abutment 47 is fixed for example to the slide 40 which at the two end positions reverses a lever 48 or 49 and thereby reverses the direction of rotation of the spindle 41. Also the feed in the direction 38^{II} (Fig. 3) is effected automatically since a lever 50 provided with feed pawls (Fig. 2) bears against the cams 46a 46b and thereby operates a feed wheel 50a which moves a support 52 in the direction 38^{II} through a spindle not shown. The lever 50 is rocked alter-

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nately back and forth at the ends of the travel of the slide 40, one movement advancing a ratchet feed wheel one step and the opposite movement engaging the next ratchet tooth.

Figs. 4 to 7 show another embodiment of the knife mountings in which these are formed as steel strips 2¹ coiled on rollers 2¹¹ inside the roller 1¹. While in the embodiment according to Figs. 1 to 3 the knife roller 1 was horizontally disposed and the tobacco mouthpiece 3a 3b was inclined, in this embodiment according to Figs. 4 to 7 the knife roller 1¹ is inclined (see Fig. 5) so that its axis makes an angle W of for example about 5° with the upper surface in the horizontally fed tobacco strip 3 passing through the mouthpiece.

The knife strips 2¹ are fed in a direction perpendicular to their cutting edges between pairs of rollers 56, 57 and the spindles of the rollers 56 carry gear wheels 56a (see Figs. 5 to 7) in engagement with a toothed ring 58 which is freely supported on the shaft of the knife roller 1¹. The toothed ring 58 is also in engagement with a gear wheel 59 (Fig. 4) which is driven through a pinion 60 from an electric motor 61. On rotation of the knife drum 1¹ the freely supported toothed ring 58 receives the same speed as the roller 1¹ since it is carried by means of the gear wheels 56a rotating with it. The motor 61 and the gear wheels 60 however rotate at corresponding speeds. If this speed is altered during the running of the machine a relative movement is obtained between the gear ring 58 and the gear wheels 56a whereby adjustment of the knife strips 2¹ is obtained.

The motor 38¹ for grinding the knives is in the case of Figs. 4 to 7 not disposed in an inclined manner and a cap wheel 37¹ is used for grinding the knife bands. Apart from this the construction is similar to Figs. 1 to 3. In both arrangements the roller 1 and 1¹ is removable from the tobacco strip mouthpiece 3a 3b and if necessary can be moved from the mouthpiece. The drive of the rollers 1 or 1¹ is effected directly independently of the drive for the tobacco strip by means of a flange mounted motor associated with the frame carrying the rollers or indirectly by a motor 63 on the frame carrying the mouthpiece 3a, 3b, for example by means of a cable or belt drive 64, as shown in Figs. 6 and 7.

According to Figs. 1 to 6 the roller 1 or 1¹ with all its associated parts including the diamond truing devices 44, 45 is rotatably supported together with the sharpening mechanism described, for example in a subsidiary frame 1¹¹ which can be moved slidably or on rollers,

wheels or the like according to Fig. 6 outwardly away from the mouthpiece 3a 3b. A buffer 62 ensures that on moving in the frame 1¹¹ damage of the knife edges is avoided and a distributor-free stoppage of the knife roller 1 or 1¹ in the working position is obtained. It will be observed that no means are provided for adjusting the frame 1¹¹ in relation to the rest of the machine when in the working position, adjustment of the positions of the cutting edges being obtained by the setting of the diamonds 44, 45 as already explained. As shown in Fig. 6 two parts 65a 65b of a coupling are provided on the shaft of the roller 1 or 1¹ and on the shaft of the driving wheel 7a respectively which parts come into engagement one with the other in the working position of the frame 1¹¹. According to Fig. 7 the knife roller 1¹ with the sharpening mechanism is supported in a subsidiary frame 1¹¹¹¹ which is pivotally mounted at 1¹¹¹¹ on the rest of the machine frame. In this case the coupling 65a, 65b is not necessary.

In both cases the mouthpiece 3a 3b may be made completely accessible from the front so that for example foreign bodies in the mouthpiece can be removed. In order that on the entry of such foreign bodies or in those cases in which the tobacco strip 3 is not clearly cut through at the mouthpiece 3a 3b, automatic stoppage of the machine is obtained, at a suitable part of the roller 1 (Figs. 1 and 2) is provided a feeler strip 66 which is pivotally mounted at 67. The lever 68 is rigid with the strip 66 which by means of a roller 68a bears on a lever 69 which in turn is under the influence of the spring 70. If a projecting end of the tobacco strip which is not clearly cut off or an uncut foreign body projects to an extent from the mouthpiece 3a 3b, beyond the permissible limit, the outer edge of the feeler strip 66 comes into contact with the foreign body so that the strip 66 is moved to the position shown in dotted lines. Thereby the lever 68 by means of the roller 68a on the free end thereof also in dotted line position, tilts the lever 69 in a clockwise direction. In this position 69¹ the free end of the lever 69 comes, on further rotation of the lever 1, into the path of the stationary motor switch 71 and of a lever 72 which at its other end locks or retains a lever 73 to which is fixed one end of a band brake 74. The other end of the brake 74 is secured at 74a to the frame of the machine. By striking the lever 71 the motor not shown for driving the roller 1 is stopped and by striking the lever 72 the lever 73 is released whereby the band brake 74, 74a comes into action by the

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tension of the spring 75 and the roller 1 is quickly brought to rest.

After sliding away (Fig. 6) or pivoting (Fig. 7) the subsidiary frame carrying the knife roller, the foreign body can be removed and the end of the tobacco strip trimmed off. For this purpose an additional cutting device is provided comprising a trimming knife which also serves when starting the machine and when the roller 1 is still separated from the mouthpiece, for trimming off the still insufficiently compressed initial end of the strip. This trimming knife according to Fig. 1 consists for example of a knife plate 76 which can be raised and lowered by means of a hand crank 77, a worm drive 78, pinion 79 and a rack 80 (see also Fig. 3). In order that the trimming knife 76, cannot in the lowest position, not shown, strike the knife roller in the horizontally displaced or pivoted position, a projection 81 or the like on the knife plate 76 is provided against which the knife roller 1 will act if it should be brought into operation in error.

In order that when cutting the tobacco strip the cut tobacco shall not collect below the knife edges the recessed parts 1d of the roller surface 1¹, are connected through passages, one of which is indicated at 81¹ (Fig. 4) with the hollow shaft of the roller 1 and the shaft is connected to a pressure system not shown whereby tobacco collecting in the spaces 1d may be blown away. Below the mouthpiece 3a a suction device may be provided in order to remove a tobacco waste or residue. A collecting channel 82 (Figs. 1 and 4) below the grinding wheel 37, serves for collecting the grinding dust in order that this shall not come into contact with the tobacco.

What I claim is:—

1. A tobacco cutting machine in which the tobacco is forced through a mouthpiece and in which a rotary cutter roller provided with knives on its periphery is arranged in front of the mouthpiece characterised in that the sharpening mechanism for said knife roller and trueing means acting on said sharpening mechanism are all located in a subsidiary frame which is separable from a frame supporting the rest of the machine and that said sharpening mechanism is operable during the cutting operation, the setting of the trueing means in the subsidiary frame determining the position of the sharpening mechanism and consequently the position of the cutting edges of the knives in relation to the mouthpiece when the subsidiary frame is in its working position adjacent the mouthpiece.

2. A tobacco cutting machine according to claim 1 characterised in that the knife roller is so mounted in the subsidiary frame that the adjustable knife blades running parallel to the roller axis, make an angle of about 5° with the upper surface of the tobacco strip facing it.

3. A tobacco cutting machine according to claim 1 or 2 characterised in that the subsidiary frame can be slid or pivoted away from the frame supporting the rest of the machine carrying the mechanism for introducing and pressing the tobacco.

4. A tobacco cutting machine according to any of the foregoing claims characterised in that the tobacco mouthpiece is inclined in such manner that the under edge of the upper mouthpiece jaw makes an angle of about 5° with the axis of the horizontally supported cutter roller so that the said under edge of the upper mouthpiece jaw with the upper edge of the lower mouthpiece jaw are arranged in inclined manner.

5. A tobacco cutting machine according to any of the foregoing claims characterised in that buffer means are provided which hinder or minimise damage to the knives when the subsidiary frame is brought to the working position and permit a shock-free stoppage of said frame in said position.

6. A tobacco cutting machine according to claim 1 characterised in that an additional cutting device is provided for cutting the tobacco strip when the subsidiary frame is moved out of the working position.

7. A tobacco cutting machine according to claims 1 to 6 characterised in that the tobacco feed and compressing is effected between two conveyor bands of which the upper conveyor band is pivotally mounted and exerts pressure on the tobacco strip and is connected through a rod with the upper mouthpiece jaw so that the latter executes a rectilinear up and down movement.

8. A tobacco cutting machine according to claims 1 to 7 characterised in that the drive for the tobacco feed is effected independently of that for the cutter roller, and gear wheels on the shafts of the conveyor band pulleys adjacent the mouthpiece remain each in constant engagement with their driving wheel, these gear wheels being moved by a connecting rod system having a pivoting action.

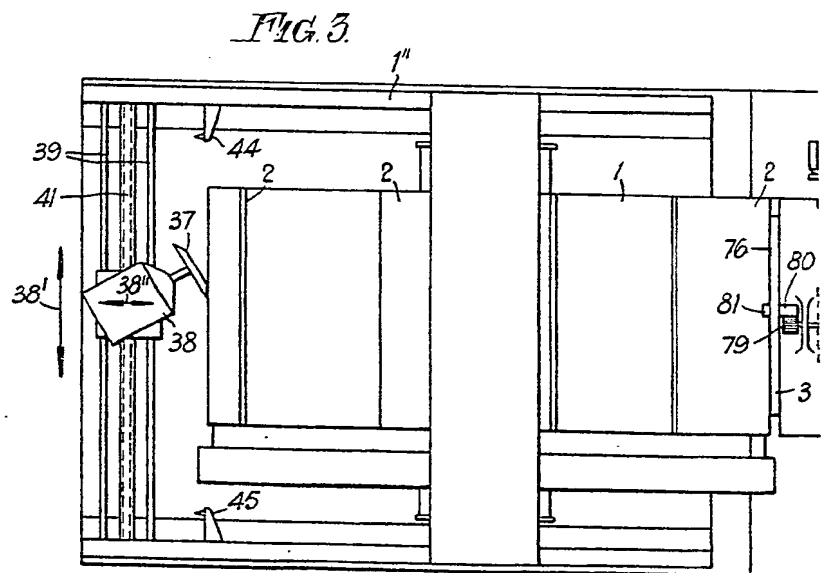
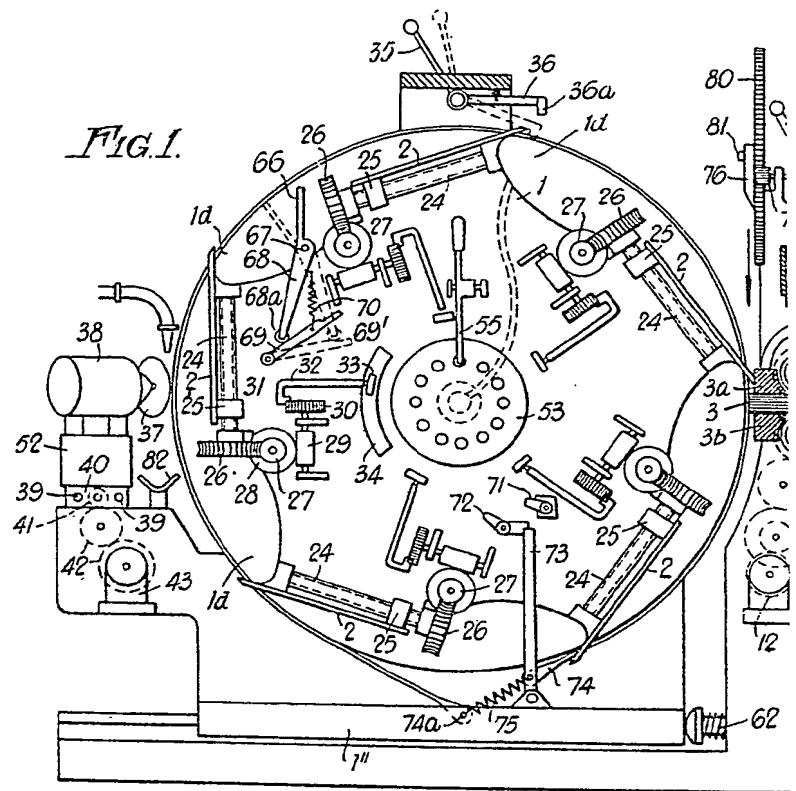
9. A tobacco cutting machine according to claims 1 to 7 characterised in that the upper conveyor band is adapted to be raised by a crank or the like from outside the frame supporting the rest of the machine.

10. A tobacco cutting machine according to claims 1 to 8 characterised in that the separate drive for the cutter roller is arranged indirectly by means of a motor on the frame supporting the rest of the machine.
11. A tobacco cutting machine according to claims 1 to 10 characterised in that a lever system is provided on the subsidiary frame embodying an adjustable abutment movable into the path of the knife edges.
12. A tobacco cutting machine according to claims 1 to 11 characterised in that the cutter roller is adapted to be retained or held stationary in the subsidiary frame supporting it.
13. A tobacco cutting machine according to claims 1 to 12 characterised in that the subsidiary frame separable from the tobacco mouthpiece embodies a motor carrying a grinding wheel movable both back and forth parallel to the roller axis and also transversely thereto, and independently of the roller and tobacco drive and the grinding wheel is trued by diamonds at the end positions of the back and forth movement in the presence of a cooling fluid and wherein a collecting channel is provided beneath the grinding wheel for receiving the grinding dust.
14. A tobacco cutting machine according to claims 1 to 13 characterised in that a feeler strip is provided on the cutter roller which on striking a foreign body in the tobacco strip brings an abutment into the path of a switch for stopping the motor and a lever for braking the roller.
15. A tobacco cutting machine according to claims 1 to 14 characterised in that parts of the cutter roller below the knife edges are recessed and connected through passages with a hollow shaft of the cutter roller which is connected to an air pressure line.
16. A tobacco cutting machine according to claims 1 to 15 characterised in that the knives on the periphery of the cutter roller are continuously, automatically and individually adjusted in that each knife in succession upon each rotation of the roller after transit across the tobacco strip, is fed to a slight extent by operation of a feed device appertaining to each knife by means of a stationary cam through a suitable reduction drive and a feed screw.
17. A tobacco cutting machine according to claims 1 to 16 characterised in that each knife can be adjusted by hand after disconnection of the reduction drive.
18. A tobacco cutting machine according to claims 1 to 14 characterised in that the knives are formed of steel strips coiled on rollers supported inside the cutter roller and are led through the feed rollers which are rotatably supported on the periphery of the cutter roller for feed adjustment of the steel strips.
19. A tobacco cutting machine according to claims 1 to 15 and 18 characterised in that gear wheels on the feed rollers are in engagement with a toothed ring supported freely on the shaft of the cutter roller and which in turn engages a gear wheel the peripheral speed of which is adjustable by a motor.
20. A tobacco cutting machine constructed and arranged substantially as herein described and illustrated in the accompanying drawings.

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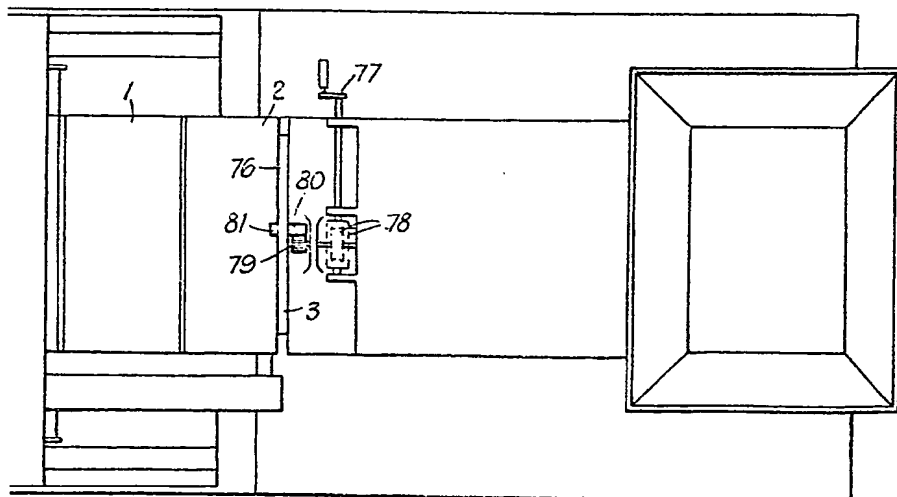
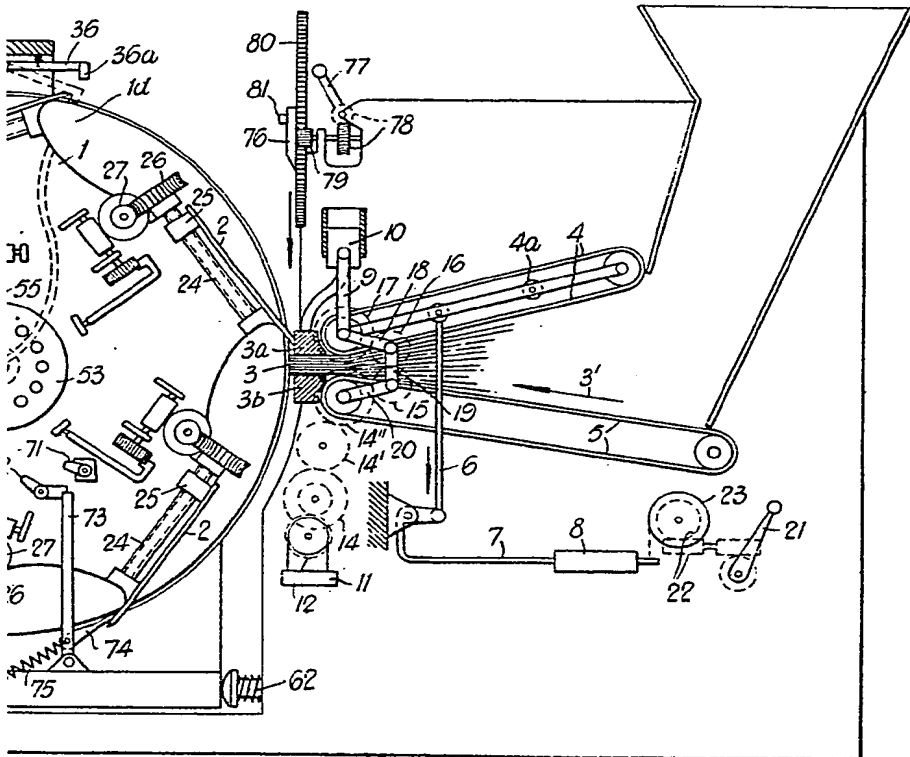
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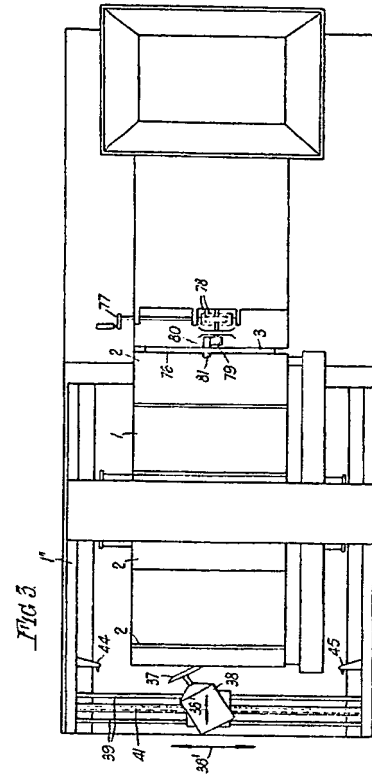
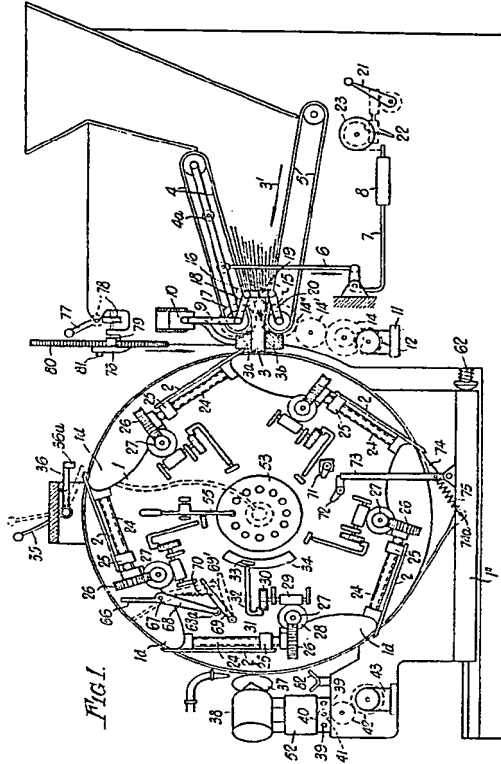
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FIG. 2.

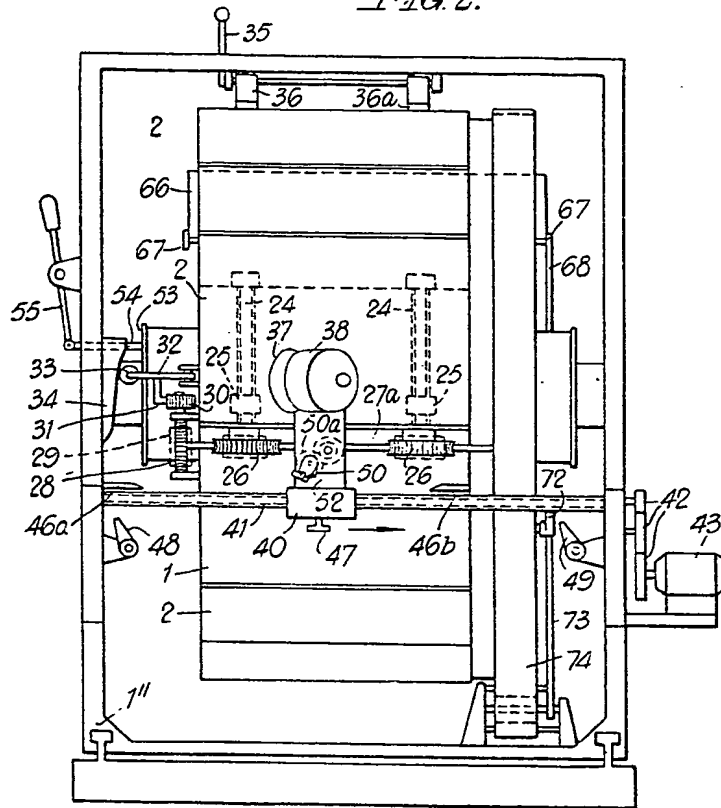
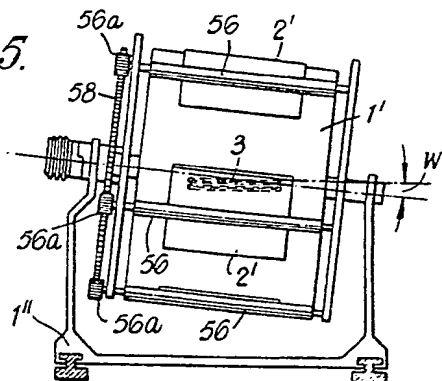


FIG. 5.

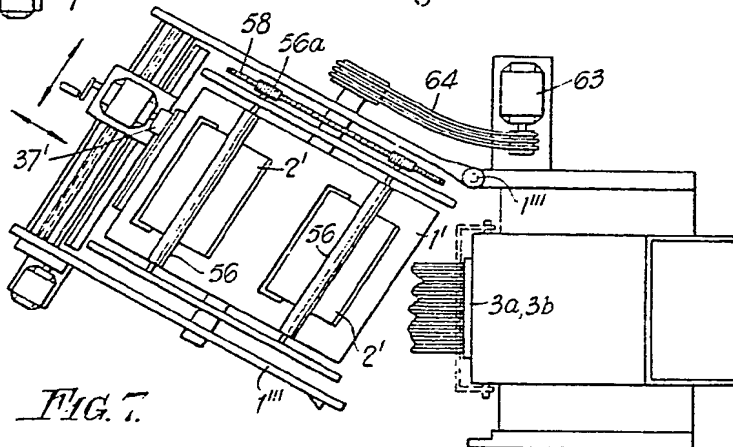
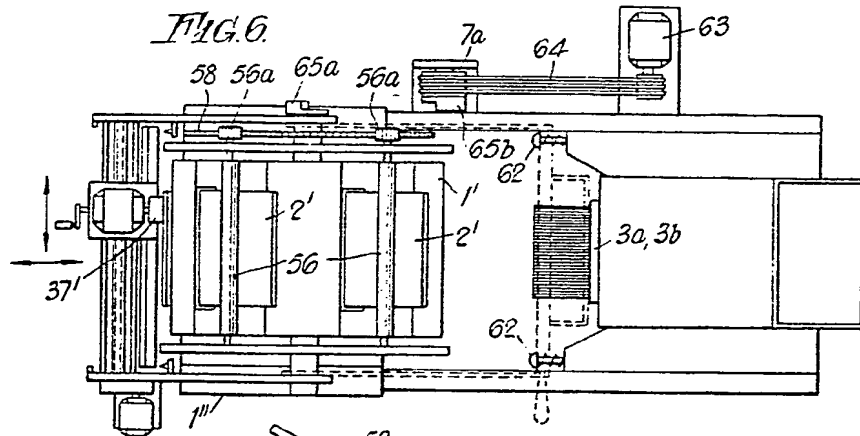
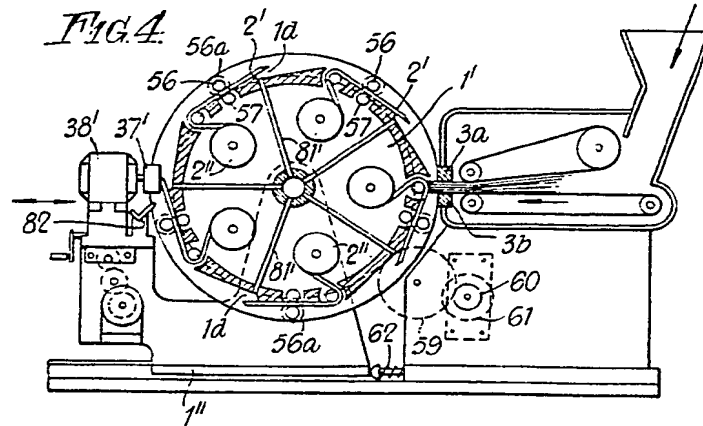


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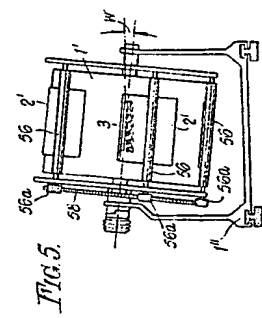
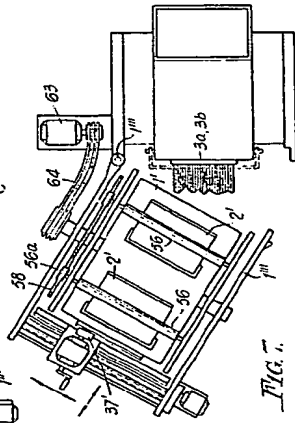
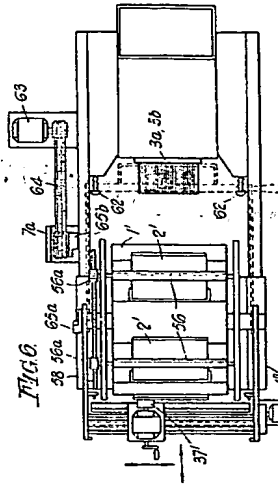
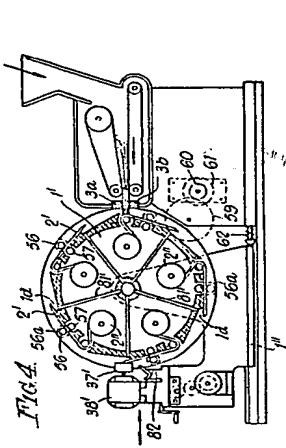
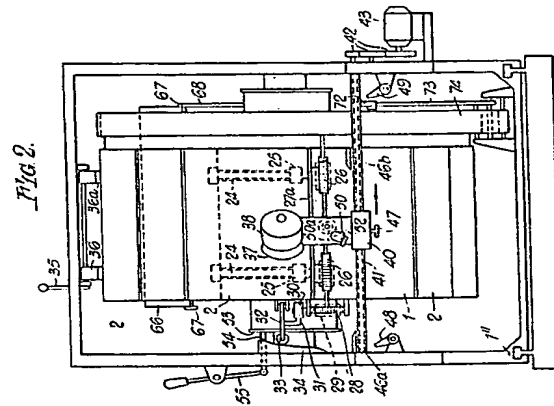
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